Exhibit R-2, RDT&E Budget Item Justification: PB 2011 Air Force										DATE: February 2010	
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602201F: *Aerospace Vehicle Technologies*							
COST ($ in Millions)	**FY 2009 Actual**	**FY 2010 Estimate**	**FY 2011 Base Estimate**	**FY 2011 OCO Estimate**	**FY 2011 Total Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
Total Program Element	119.544	138.563	144.699	0.000	144.699	149.062	145.609	149.835	152.533	Continuing	Continuing
622401: *Structures*	36.902	44.307	44.224	0.000	44.224	47.570	55.857	57.457	58.474	Continuing	Continuing
622403: *Flight Controls and Pilot-Vehicle Interface*	32.169	28.752	39.283	0.000	39.283	39.679	37.755	38.841	39.532	Continuing	Continuing
622404: *Aeromechanics and Integration*	50.473	65.504	61.192	0.000	61.192	61.813	51.997	53.537	54.527	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program investigates, develops, and analyzes aerospace vehicle technologies in the three primary areas of structures, controls, and aeromechanics. Advanced structures concepts are explored and developed to exploit new materials, fabrication processes, and design techniques. Flight control technologies are developed and simulated for aerospace vehicles. Advanced aerodynamic vehicle configurations are developed and analyzed through simulations, experiments, and multi-disciplinary analysis. Resulting technologies reduce life cycle costs and improve the performance of existing and future manned and unmanned aerospace vehicles.

This program is in Budget Activity 2, Applied Research, since it develops and determines the technical feasibility and military utility of evolutionary and revolutionary aerospace vehicle technologies.

Exhibit R-2, RDT&E Budget Item Justification: PB 2011 Air Force	DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602201F: *Aerospace Vehicle Technologies*

B. Program Change Summary ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Previous President's Budget	123.036	127.129	0.000	0.000	0.000
Current President's Budget	119.544	138.563	144.699	0.000	144.699
Total Adjustments	-3.492	11.434	144.699	0.000	144.699
• Congressional General Reductions		0.000			
• Congressional Directed Reductions		0.000			
• Congressional Rescissions	0.000	-0.586			
• Congressional Adds		12.020			
• Congressional Directed Transfers		0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	-3.492	0.000	144.699	0.000	144.699

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2009	FY 2010
Project: 622403: *Flight Controls and Pilot-Vehicle Interface*		
Congressional Add: *Cognitive Unmanned Air Vehicles.*	0.499	0.000
Congressional Add Subtotals for Project: 622403	0.499	0.000
Project: 622404: *Aeromechanics and Integration*		
Congressional Add: *Materials Integrity Management Research for the Air Force*	0.000	2.987
Congressional Add: *Unmanned Air Vehicle Sensor and Maintenance Development Center*	0.000	3.900
Congressional Add: *Unmanned Aerial System Exploitation*	0.000	3.485
Congressional Add: *Unmanned Sense, Track, and Avoid Radar*	0.000	1.593
Congressional Add Subtotals for Project: 622404	0.000	11.965
Congressional Add Totals for all Projects	0.499	11.965

Exhibit R-2, RDT&E Budget Item Justification: PB 2011 Air Force	DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602201F: *Aerospace Vehicle Technologies*

Change Summary Explanation

Note 1: The FY 2010 President's Budget submittal did not reflect FY 2011 through FY 2015 funding. A detailed explanation of changes between the two budget positions is not provided because it cannot be made in a relevant manner.

Note 2: In FY 2010 Congress added $1.5 million for Unmanned Sense, Track, and Avoid Radar, $2.98 million for Materials Integrity Management Research for the Air Force, $3.9 Unmanned Air Vehicle Sensor and Maintenance Development Center, and $3.48 million for Unmanned Aerial System Exploitation.

(U) C. Performance Metrics
Under Development

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force			DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602201F: *Aerospace Vehicle Technologies*	PROJECT 622401: *Structures*	

COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
622401: *Structures*	36.902	44.307	44.224	0.000	44.224	47.570	55.857	57.457	58.474	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops advanced structures concepts to exploit new materials and fabrication processes and investigates new structural concepts and design techniques. New structural concepts include incorporating subsystem hardware items (e.g., antennas, sensors, directed energy weapon components, and integrated energy storage) and adaptive mechanisms into the aerospace structures and/or skin of the aircraft. Resulting technologies strengthen and extend the life of current and future manned and unmanned aerospace vehicle structures, while providing increased capabilities. Payoffs to the warfighter include reduced weight and cost, as well as improved operability and maintainability of aerospace vehicles.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
MAJOR THRUST: Develop an economic service life analysis capability comprised of analysis tools, methodologies, and structural health monitoring schemes.	3.593	25.976	18.820	0.000	18.820
FY 2009 Accomplishments: In FY 2009: Continued development of structural health management schemes for structures susceptible to damage. Continued the development of economic service life analysis and structural design tools for current and future aircraft, enhancing capabilities, component replacement, and technology direction. Continued the development of analysis tools into life prediction and failure analysis. Continued to develop failure criteria tools for advanced high temperature aircraft components and concepts.					
FY 2010 Plans: In FY 2010: Initiate the development of health reasoners for determination of system health. Continue the development of economic service life analysis and structural design tools for current and future aircraft, enhancing capabilities, component replacement, and technology direction. Continue to incorporate newly developed analysis tools into life prediction and failure analysis. Continue to					

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602201F: *Aerospace Vehicle Technologies*	PROJECT 622401: *Structures*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
develop failure criteria tools for advanced high temperature aircraft components and concepts. Continue the development of residual stress processes to enhance service life. *FY 2011 Base Plans:* In FY 2011: Continue the development of health reasoners for determination of system health. Continue the development of economic service life analysis and structural design tools for current and future aircraft, enhancing capabilities, component replacement, and technology direction. Incorporate newly developed analysis tools into life prediction and failure analysis. Complete the development of failure criteria tools for advanced high temperature aircraft components and concepts. Continue the development of residual stress processes to enhance service life. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A					
MAJOR THRUST: Develop methodologies to reduce the cost and time involved in actual full-scale testing of components and aircraft prior to obtaining airworthiness certification. *FY 2009 Accomplishments:* In FY 2009: Continued development of analytical certification methodologies that incorporate advanced methods, concepts, diagnostic techniques, and manufacturing technologies into aircraft components and airframe design. Initiated development of high-fidelity and continued real-time analytical certification methodologies that improve airworthiness certification process and reduce development and testing for aircraft and components subject to dynamics loads. *FY 2010 Plans:* In FY 2010: Continue development of analytical certification methodologies that incorporate advanced methods, concepts, diagnostic techniques, and manufacturing technologies into aircraft components, airframe design and mission planning. Initiate the development of response prediction methodologies.	3.322	4.043	6.432	0.000	6.432

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Based on work performed on reliability for structures components, initiate development of reliability-based certification. *FY 2011 Base Plans:* In FY 2011: Continue development of analytical certification methodologies that incorporate advanced methods, concepts, diagnostic techniques, and manufacturing technologies into aircraft components and airframe design. Continue the development of response prediction methodologies. Initiate increased fidelity of analytical methodologies. Continue the development of reliability-based certification. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A					
MAJOR THRUST: Develop design methods to capitalize on new materials, multirole considerations, and integration of various subsystem hardware items and adaptive mechanisms into the actual aircraft. *FY 2009 Accomplishments:* In FY 2009: Continued the development, evaluation, and assessment of design and analysis methods and components that enable the integration of structures. Continued the development, evaluation, assessment, and ground testing of adaptive structures, subsystem hardware, and antenna integration into load-bearing structures to create multi-function or ultra-lightweight concepts, which provides for increased energy efficiencies. Continued development, analysis, evaluation, and simulation of innovative technologies to advance active aero elastic design concepts, adaptive structures, aerodynamic flow control technologies, system health reasoners, and active denial concepts. Continued characterization of high energy laser concepts. Continued development, evaluation, and assessment of multi-functional structures to include ground demonstration of energy storage concepts, integrated distributed electronics, and homogeneous sensor integration systems.	16.609	5.806	7.923	0.000	7.923

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602201F: *Aerospace Vehicle Technologies*	PROJECT 622401: *Structures*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2010 Plans: In FY 2010: Continue the development of multirole aircraft structural concepts. Continue the development, evaluation, and assessment of design and analysis methods and components that enable the integration of structures with other air vehicle functions to reduce cost and weight, as well as increase the survivability and performance of future systems. Continued the development, evaluation, assessment, and ground testing of adaptive structures, subsystem hardware, and antenna integration into load-bearing structures to create multi-function or ultra-lightweight concepts. Continue the development, analysis, and evaluation of innovative technologies that integrate active aeroelastic design concepts, adaptive structures, aerodynamic flow control technologies and aerodynamic handling/maneuverability to enable viable long-range and long endurance air vehicle and micro air vehicle concepts. Continue development, evaluation, and assessment of multi-functional structures to include ground demonstration of energy storage concepts and integrated distributed electronics. *FY 2011 Base Plans:* In FY 2011: Continue the development of multirole aircraft structural concepts. Continue the development, evaluation, and assessment of design and analysis methods and components that enable the integration of structures with other air vehicle functions to reduce cost and weight, as well as increase the survivability and performance of future systems. Continue the development, analysis, and evaluation of innovative technologies that integrate active aeroelastic design concepts, adaptive structures, aerodynamic flow control technologies and aerodynamic handling/maneuverability of micro air vehicle concepts. Develop and demonstrate system level thermal management concepts to meet the need of multifunction, multirole, and adaptive aircraft. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A					
MAJOR THRUST: Develop technologies that will permit the structural development of aircraft that can operate at an extreme altitude, while at sustained speeds greater than Mach 2.	13.378	8.482	11.049	0.000	11.049

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2009 Accomplishments: In FY 2009: Further developed technologies that incorporate advanced materials and design concepts for the creation of an integrated air vehicle structure that can withstand extreme flight environments. Technologies will improve durability of existing and future aerospace vehicle structures resulting in reduced cost and increased life. Incorporated newly developed structural concepts and analysis methods for design and evaluation of hot primary structure. *FY 2010 Plans:* In FY 2010: Further develop technologies that incorporate advanced materials and design concepts for the creation of an integrated air vehicle structure that can withstand extreme flight environments. Technologies will improve durability of existing and future aerospace vehicle structures resulting in reduced cost and increased life. Complete the development of concepts to advanced, all weather, durable, thermal protections systems. Continue and refine operationally responsive space access concepts. Initiate research to develop and apply these technologies for lower cost, reduced weight expendable vehicle airframes. *FY 2011 Base Plans:* In FY 2011: Further develop technologies that incorporate advanced materials and design concepts for the creation of an integrated air vehicle structure that can withstand extreme flight environments. Technologies will improve durability of existing and future aerospace vehicle structures resulting in reduced cost and increased life. Continue to develop structural concepts and analysis methods for design and evaluation of hot primary structure. Continue and refine operationally responsive space access concepts and apply these technologies for lower cost, reduced weight expendable vehicle airframes. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A					
Accomplishments/Planned Programs Subtotals	36.902	44.307	44.224	0.000	44.224

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602201F: *Aerospace Vehicle Technologies*	PROJECT 622401: *Structures*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• PE 0602102F: *Materials.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603112F: *Advanced Materials for Weapon Systems.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603211F: *Aerospace Technology Dev/Demo.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

D. Acquisition Strategy

Not Applicable.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force			DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602201F: *Aerospace Vehicle Technologies*	PROJECT 622403: *Flight Controls and Pilot-Vehicle Interface*	

COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
622403: *Flight Controls and Pilot-Vehicle Interface*	32.169	28.752	39.283	0.000	39.283	39.679	37.755	38.841	39.532	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops technologies that enable maximum affordable capability from manned and unmanned aerospace vehicles. Advanced flight control technologies are developed for maximum vehicle performance throughout the flight envelope and simulated in virtual environments. Resulting technologies contribute significantly towards the development of reliable autonomous unmanned air vehicles, space access systems with aircraft-like operations, and extended-life legacy aircraft. Payoffs to the warfighter include enhanced mission effectiveness, optimized flight safety, increased survivability, improved maintenance, and decreased size, weight, and cost. Leverages a network of synthetic environments for evaluation of advanced concepts.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
MAJOR THRUST: Develop advanced flight control systems, components, and integrated vehicle monitoring systems for both manned and unmanned aircraft.	15.982	7.981	9.562	0.000	9.562
FY 2009 Accomplishments: In FY 2009: Furthered the development and assessment of advanced control mechanization technologies to provide highly reliable operations for manned and unmanned systems under adverse environments at significantly reduced size, weight, and cost. Initiated development of control architecture enhancements to enable design for certification to ease validation and verification for complex and adaptive unmanned systems. Initiated development of low-maintenance/fault tolerant control-effector technology for aerospace applications.					
FY 2010 Plans: In FY 2010: Further the development, assessment, and certification of advanced control mechanization technologies to provide highly reliable operations for manned and unmanned systems under adverse environments at significantly reduced size, weight, and cost. Develop control					

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602201F: *Aerospace Vehicle Technologies*	PROJECT 622403: *Flight Controls and Pilot-Vehicle Interface*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
configurations for small and micro-sized unmanned air vehicles to enable air deployment as well as operations in complex and urban environments. *FY 2011 Base Plans:* In FY 2011: Further the development, assessment, and certification of advanced control mechanization technologies to provide highly reliable operations for manned and unmanned systems under adverse environments at significantly reduced size, weight, and cost. Continue development of control configurations for small and micro-sized unmanned air vehicles to enable air deployment/ recovery as well as operations in complex mission environments. Initiate development of control architecture enhancements to enable design for certification to ease validation and verification for complex and adaptive unmanned systems. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A					
MAJOR THRUST: Develop flight control systems that will permit safe interoperability between manned and unmanned aircraft. *FY 2009 Accomplishments:* In FY 2009: Continued to develop and assess novel control automation techniques and adaptive algorithms to enable safe and interoperable application of manned and unmanned aerospace systems. Completed reliability and performance analysis of self-organizing, distributed control of multi-unmanned vehicle flight formations. Completed development of cooperative control techniques for close-in surveillance of urban environments. Initiated development for interoperability of unmanned vehicles in terminal area and ground operations. *FY 2010 Plans:* In FY 2010: Continue to develop and assess novel control automation techniques and adaptive algorithms to enable safe, interoperable, and integrated application of manned and unmanned	8.765	16.304	13.664	0.000	13.664

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
aerospace systems. Initiate reliability and performance analysis of mixed-initiative control of multi-unmanned vehicle packages. Initiate development and assessment of cooperative control techniques of heterogeneous systems for close-in surveillance. Initiate technology development for the safe interoperability of unmanned vehicles in airspace, the terminal area, and ground operations. *FY 2011 Base Plans:* In FY 2011: Continue to develop and assess novel control automation techniques and adaptive algorithms to enable safe, interoperable, and application integration for manned and unmanned aerospace systems. Continue reliability and performance analysis of mixed-initiative control of multi-unmanned vehicle packages. Continue development and assessment of cooperative control techniques of heterogeneous systems for close-in surveillance. Continue technology development for the safe interoperability of multiple unmanned vehicles in airspace, in the terminal area, during refueling, and in ground operations. Refine the development and assessment of adaptive guidance and control technologies for fault/damage tolerance and rapid flight planning of aerospace vehicle operations. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A					
MAJOR THRUST: Develop tools and methods for capitalizing on simulation-based research and development of future aerospace vehicles. *FY 2009 Accomplishments:* In FY 2009: Refined network-centric environment to broaden advanced technology assessment capability. Expanded breadth of simulation analyses in refined net-centric environment to address multi-directorate technology trade studies for refined long-range strike and reconnaissance concepts. Conducted simulations to analyze advanced launch and reentry technologies for access-to-space concepts.	6.923	4.467	16.057	0.000	16.057

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2010 Plans: In FY 2010: Refine multi-disciplinary, net-centric simulation environments and models to enable the quantitative and qualitative assessment of advanced aerospace vehicle concepts and technologies under realistic mission conditions. Design and conduct simulation events to evaluate and assess the military utility and suitability of new technologies and new aerospace concepts. Continue simulation analyses and multi-directorate technology trade studies on strike, transport, access-to-space, and reconnaissance concepts. Continue technology trade studies of small and medium sized unmanned air vehicles in hostile urban environments. *FY 2011 Base Plans:* In FY 2011: Refine multi-disciplinary, net-centric simulation environments and models to enable the quantitative and qualitative assessment of advanced aerospace vehicle concepts and technologies under realistic mission conditions. Continue to design and conduct simulation events to evaluate and assess the military utility and suitability of new technologies and new aerospace concepts. Refine simulation analyses and multi-directorate technology trade studies on strike, transport, access-to-space, and reconnaissance concepts. Refine technology trade studies of unmanned air vehicles in manned/unmanned airspace and airbase operations, as well as in hostile mission environments. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A					
Accomplishments/Planned Programs Subtotals	31.670	28.752	39.283	0.000	39.283

	FY 2009	FY 2010
Congressional Add: Cognitive Unmanned Air Vehicles.	0.499	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
FY 2009 Accomplishments: In FY 2009: Conducted Congressionally-directed effort for Cognitive Unmanned Air Vehicles. *FY 2010 Plans:* In FY 2010: Not Applicable.		
Congressional Adds Subtotals	0.499	0.000

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• PE 0602202F: *Human Effectiveness Applied Research.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602204F: *Aerospace Sensors.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603211F: *Aerospace Technology Dev/Demo.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0604015F: *Next Generation Bomber.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

D. Acquisition Strategy

Not Applicable.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force			DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602201F: *Aerospace Vehicle Technologies*	PROJECT 622404: *Aeromechanics and Integration*	

COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
622404: *Aeromechanics and Integration*	50.473	65.504	61.192	0.000	61.192	61.813	51.997	53.537	54.527	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops aerodynamic configurations of a broad range of revolutionary, affordable aerospace vehicles. It matures and applies modeling and numerical simulation methods for fast and affordable aerodynamics prediction and integrates and demonstrates multi-disciplinary advances in airframe, propulsion, weapon, and air vehicle control integration. Technologies developed will greatly enhance warfighter capability in aircraft, missiles, and high-speed aerospace vehicles. The payoffs from these technology programs include lower vehicle costs (both production and operations and support costs), increased payload and range capability, and improved supportability, safety, and survivability of aerospace vehicles.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
MAJOR THRUST: Develop aerodynamic prediction efforts centered on expanding the design capabilities of manned and unmanned air vehicles.	3.508	2.700	3.487	0.000	3.487
FY 2009 Accomplishments: In FY 2009: Continued efforts to develop and assess aeronautical technologies that enable broad use of unmanned air vehicles in future missions, including offensive missions, to reduce life cycle costs. Continued to perform mission assessment and develop low-cost unmanned air vehicle concepts to perform tactical surveillance and weapon delivery.					
FY 2010 Plans: In FY 2010: Continue to perform mission assessments and develop low-cost unmanned air vehicle concepts to perform current and future missions including tactical surveillance and weapon delivery. Continue to develop and assess aeronautical technologies that enable broad use of unmanned air vehicles in future missions to reduce life cycle costs and decrease human risk. Continue development of technologies for improved weapon delivery and propulsion system performance. Continue work					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
to develop and demonstrate flow control to enable fluidic thrust vectoring, area control, and thermal management for an unmanned air vehicle exhaust nozzle. Continue development of innovative aerodynamic control methods for small unmanned air vehicles. *FY 2011 Base Plans:* In FY 2011: Continue to perform mission assessments and develop low-cost unmanned air vehicle concepts to perform current and future missions including tactical surveillance and weapon delivery. Continue to develop and assess aeronautical technologies that enable broad use of unmanned air vehicles in future missions to reduce life cycle costs and decrease human risk. Continue development of technologies for improved weapon delivery and propulsion system performance. Continue work to develop and demonstrate flow control to enable fluidic thrust vectoring, area control, and thermal management for an unmanned air vehicle exhaust nozzle. Continue development of innovative aerodynamic control methods for small unmanned air vehicles. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A					
MAJOR THRUST: Develop new and improved concepts, designs, and analysis of technologies to enable revolutionary capabilities for sustained high-speed re-useable high altitude vehicle efforts. *FY 2009 Accomplishments:* In FY 2009: Continued development and assessment of aerospace technologies that enable sustained high-speed flight to permit global reach. Initiated advanced high-speed aero/flight control development. Initiated study of interaction of high-load, high-temperature flexible structural materials and fluid mechanics of inlet. *FY 2010 Plans:* In FY 2010: Continue development and assessment of aerospace technologies for high-speed flight. Continue development of techniques for propulsion integration technologies. Continue to develop	21.121	15.044	27.518	0.000	27.518

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602201F: *Aerospace Vehicle Technologies*	PROJECT 622404: *Aeromechanics and Integration*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
advanced high-speed aero/flight control and study of aeroelastic effects for high speed vehicles. Continue to characterize high-speed phenomena and develop and validate high-speed component technologies. *FY 2011 Base Plans:* In FY 2011: Continue development and assessment of aerospace technologies that enable sustained high-speed flight to permit global reach. Continue development of analysis/design techniques and tools to enable shock/boundary layer interaction flow control and enhanced stability for high speed propulsion concepts. Continue development and demonstration of high performance high speed mixed compression inlet concepts utilizing advanced flow control technologies for Mach 3+ expendable systems. Develop and test inlet variable geometry concepts that meet balanced mission performance and survivability requirements. Continue to develop advanced high-speed aero/flight control and study of aeroelastic effects for high speed vehicles. Continue efforts to characterize high-speed phenomena and develop and validate fundamental high-speed component technologies through experimental flight techniques in a relevant environment. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A					
MAJOR THRUST: Develop new and improved concepts, designs, and analysis of technologies to enable revolutionary capabilities for re-useable, high altitude vehicle. *FY 2009 Accomplishments:* In FY 2009: Continued development and assessment of aerospace technologies that enable re-usable, space-access vehicle. Enhanced robust design methodology and integration approaches for high-speed aeropropulsion. Continued extensive application and 3-D validation experience in applying aerothermal computational tools to conceptual, ground-tested and flight-tested vehicles traveling at high-speeds. Refined unique high temperature structures and materials in support of high speed re-usable space-access aircraft. Continued multi-disciplinary optimization of complex high-	6.597	2.060	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602201F: *Aerospace Vehicle Technologies*	PROJECT 622404: *Aeromechanics and Integration*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
speed, high temperature, re-usable air vehicles. Initiated design and test of components of integrated high-speed, space-access air vehicle system. *FY 2010 Plans:* In FY 2010: Continue development and assessment of aerospace technologies that enable re-usable, space-access vehicle. Continue extensive application and 3-D validation efforts in applying aerothermal and material response computational tools to conceptual, ground-tested and flight-tested vehicles traveling at high-speeds. Continue development of multi-disciplinary optimization methods for complex high-speed, high temperature, re-usable air vehicles. Continue development of the robust hypersonic propulsion design methodology and exploration of advanced hypersonic propulsion integration approaches. Continue design and testing of components, subsystems and integrated systems for high-speed space-access vehicles. Initiate work to develop and validate technologies and methods for assessing the operability, availability and operational cost of high speed flight vehicles and reusable space access systems. *FY 2011 Base Plans:* In FY 2011: Not Applicable. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A					
MAJOR THRUST: Develop enabling technologies to allow integration of directed energy weapons into current and future air vehicle platforms. *FY 2009 Accomplishments:* In FY 2009: Continued development of combined flow control and adaptive optics systems to optimize directed energy system performance on large low-speed aircraft. Continued development of analysis tools for predicting the performance of advanced flow control and adaptive optics systems.	1.205	2.210	2.533	0.000	2.533

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2010 Plans: In FY 2010: Continue development of combined flow control and adaptive optics systems to optimize directed energy system performance on large low-speed aircraft. Initiate work to apply advanced analysis tools to predict the performance of flow control and adaptive optics systems for capabilities of interest to the Air Force. *FY 2011 Base Plans:* In FY 2011: Continue development of combined flow control and adaptive optics systems to optimize directed energy system performance on large low-speed aircraft. Continue work to apply advanced analysis tools to predict the performance of flow control and adaptive optics systems for problems of interest to the Air Force. Initiate development of combined flow control and adaptive optics systems for transonic/supersonic aircraft. Extend development of analysis tools for prediction of advanced flow control and adaptive optics to higher speed transonic/supersonic flows. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A					
MAJOR THRUST: Develop and assess technologies for the next generation of multi-role large aircraft. *FY 2009 Accomplishments:* In FY 2009: Continued development and assessment of aeronautical technologies including high-lift systems, transonic, and structural concepts that enable revolutionary tanker and transport aircraft designs for rapid global mobility. Continued to develop technologies that enable multiple roles and missions for delivery and support aircraft. Optimized configuration for trade-off between short take-off and landing performance and high speed cruise. Continued development of inlet and integration technologies for an advanced mobility platform designed to operate efficiently at transonic speeds and provide short take-off capabilities. Continued support to SECAF-directed effort (Energy Conservation - Assured Fuels Initiative). Conducted wind tunnel experiments and multidisciplinary design concept assessments to show the feasibility of mobility aircraft using 40% less energy through the use of	18.042	31.525	27.654	0.000	27.654

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
natural and artificial laminar boundary layers, alternative fuels, and very high bypass propulsion integration. *FY 2010 Plans:* In FY 2010: Continue development and assessment of aeronautical technologies including high-lift systems, transonic configuration optimization, and structural concepts that enable revolutionary tanker and transport aircraft designs for rapid global mobility. Continue to develop technologies that enable multiple roles and missions for delivery and support aircraft. Optimize configuration for trade-off between short take-off and landing performance and high speed cruise. Continue development of inlet and integration technologies for an advanced mobility platform designed to operate efficiently at transonic speeds and provide short take-off capabilities. *FY 2011 Base Plans:* In FY 2011: Continue development and assessment of aeronautical technologies including high-lift systems, transonic configuration optimization, and structural concepts that enable revolutionary tanker and transport aircraft designs for rapid global mobility. Continue to develop technologies that enable multiple roles and missions for delivery and support aircraft. Refine configuration for trade-off between short take-off and landing performance and high speed cruise. Continue development of inlet and integration technologies for an advanced mobility platform designed to operate efficiently at transonic speeds and provide short take-off capabilities. Continue support to SECAF-directed effort (Energy Conservation - Assured Fuels Initiative). Conduct wind tunnel experiments to show the feasibility of mobility aircraft using 40% less energy through the use of natural and artificial laminar boundary layers, alternative fuels and very high bypass propulsion integration. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A					
Accomplishments/Planned Programs Subtotals	50.473	53.539	61.192	0.000	61.192

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
Congressional Add: Materials Integrity Management Research for the Air Force *FY 2009 Accomplishments:* In FY 2009: Not Applicable. *FY 2010 Plans:* In FY 2010: Conduct Congressionally direct effort in materials intefrity management research for the Air Force.	0.000	2.987
Congressional Add: Unmanned Air Vehicle Sensor and Maintenance Development Center *FY 2009 Accomplishments:* In FY 2009: Not Applicable. *FY 2010 Plans:* In FY 2010: Conduct Congressionally direct effort in unmanned air vehicle sensor and maintenance development center.	0.000	3.900
Congressional Add: Unmanned Aerial System Exploitation *FY 2009 Accomplishments:* In FY 2009: Not Applicable. *FY 2010 Plans:* In FY 2010: Conduct Congressionally direct effort in unmanned aerial system exploitation.	0.000	3.485
Congressional Add: Unmanned Sense, Track, and Avoid Radar	0.000	1.593

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
FY 2009 Accomplishments: In FY 2009: Not Applicable. *FY 2010 Plans:* In FY 2010: Conduct Congressionally direct effort in unmanned asense, track, and avoid radar.		
Congressional Adds Subtotals	0.000	11.965

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• PE 0603211F: *Aerospace Technology Dev/Demo.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0604015F: *Next Generation Bomber.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

D. Acquisition Strategy

Not Applicable.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.